

Claims

[c1] *Sub 1/3* A biopsy tool for removing large quantities of tissue in a brief period of time, comprising:
a hollow needle having a cylindrical lumen and a pointed distal end;
a slot of elongate, longitudinally-extending configuration formed in a cylindrical side wall of said hollow needle;
said slot having a distal end disposed proximal to said pointed distal end of said hollow needle;
an inner tube of hollow cylindrical configuration disposed within said lumen of said hollow needle;
rotation means for rotating said inner tube about its longitudinal axis;
an opening formed in said inner tube;
said opening being in intermittent registration with said slot as said inner tube rotates about its longitudinal axis;
a vacuum source in fluid communication with said lumen of said hollow needle so that tissue is pulled into said slot by said vacuum;
said opening having sharp peripheral edges so that tissue pulled into said slot by said vacuum is sheared off by a sharp peripheral edge of said opening as said opening rotates past said slot;
whereby a quantity of tissue is sliced off by said sharp peripheral edge during each rotation of said inner tube;
whereby each piece of sliced off tissue is pulled toward said vacuum source so that said slot and opening are clear of tissue for each rotation of said inner tube;
whereby a large quantity of tissue is removed by said biopsy tool in a brief amount of time;
whereby said biopsy tool eliminates a need to perform a biopsy and a tissue removal procedure in two separate steps; and
whereby each slice of tissue removed is in substantially undamaged condition so that it is suitable for use in a laboratory as a biopsy sample.

[c2] The biopsy tool of claim 1, wherein said opening is helical in configuration.

[c3] The biopsy tool of claim 1, wherein said opening is in the form of a straight slot

having a longitudinal axis of symmetry disposed at an oblique angle to a longitudinal axis of said inner tube.

- [c4] The biopsy tool of claim 1, wherein said opening has a diamond configuration.
- [c5] The biopsy tool of claim 1, wherein said opening has a corkscrew configuration.
- [c6] The biopsy tool of claim 1, wherein said opening has a sinusoidal configuration.
- [c7] The biopsy tool of claim 1, wherein said opening has a sawtooth configuration.
- [c8] The biopsy tool of claim 1, wherein said rotation means is a motor means, said motor means adapted to engage a proximal end of said inner tube.
- [c9] The biopsy tool of claim 1, further comprising irrigating means for irrigating the tissue as it is sheared off.
- [c10] The biopsy tool of claim 1, wherein said irrigating means includes a flow tube having a distal free end positioned near said slot formed in said hollow needle and a remote reservoir of liquid fluid that is in fluid communication with said flow tube.
- [c11] The biopsy tool of claim 10, wherein said flow tube is mounted on an exterior surface of said hollow needle.
- [c12] The biopsy tool of claim 10, wherein said flow tube is mounted within the lumen of said hollow needle.
- [c13] The biopsy tool of claim 10, wherein said flow tube is formed within said cylindrical side wall of said hollow needle.
- [c14] The biopsy tool of claim 1, further comprising:
 - a receptacle positioned between said vacuum source and said lumen of said hollow needle;
 - a filter trap disposed within said receptacle so that sheared tissue is drawn toward said vacuum source and captured in said filter trap.
- [c15] The biopsy tool of claim 14, further comprising a housing for housing said motor means, said housing adapted to be held in a user's hand.

[c16]

A biopsy tool for removing large quantities of tissue in a brief period of time, comprising:
a hollow needle having a cylindrical lumen and a pointed distal end;
a slot of elongate, longitudinally-extending configuration formed in a cylindrical side wall of said hollow needle;
said slot having a distal end disposed proximal to said pointed distal end of said hollow needle;
an inner tube of hollow cylindrical configuration disposed within said lumen of said hollow needle;
a motor means for rotating said inner tube about its longitudinal axis;
a hand-held housing for said motor means;
an opening formed in said inner tube;
said opening being in intermittent registration with said slot as said inner tube rotates about its longitudinal axis;
a vacuum source in fluid communication with said lumen of said hollow needle so that tissue is pulled into said slot by a vacuum;
said opening having sharp peripheral edges so that tissue pulled into said slot by said vacuum is sheared off by a sharp peripheral edge of said opening as said opening rotates past said slot;
a receptacle disposed between said lumen of said hollow needle and said vacuum source;
a filter trap disposed within said receptacle so that sheared tissue pulled from said lumen by said vacuum is captured by said filter trap;
whereby a quantity of tissue is sliced off by said sharp peripheral edge during each rotation of said inner tube;
whereby each piece of sliced off tissue is pulled toward said vacuum source so that said slot and opening are clear of tissue for each rotation of said inner tube;
whereby a large quantity of tissue is removed by said biopsy tool in a brief amount of time;
whereby said biopsy tool eliminates a need to perform a biopsy and a tissue removal procedure in two separate steps; and
whereby each slice of tissue removed is in substantially undamaged condition

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so that it is suitable for use in a laboratory as a biopsy sample.

- [c17] The biopsy tool of claim 16, further comprising irrigating means for irrigating the tissue as it is sheared off.
- [c18] The biopsy tool of claim 17, wherein said irrigating means includes a flow tube having a distal free end positioned near said slot formed in said hollow needle and a remote reservoir of liquid fluid that is in fluid communication with said flow tube.
- [c19] The biopsy tool of claim 18, wherein said flow tube is mounted on an exterior surface of said hollow needle.
- [c20] The biopsy tool of claim 18, wherein said flow tube is mounted within the lumen of said hollow needle.
- [c21] The biopsy tool of claim 18, wherein said flow tube is formed within said cylindrical side wall of said hollow needle.
- [c22] The biopsy tool of claim 18, wherein said housing for said motor housing includes a first and a second port, said first port providing fluid communication between said lumen of said hollow needle and said liquid fluid reservoir and said second port providing fluid communication between said lumen and said receptacle.
- [c23] The biopsy tool of claim 16, wherein said filter trap is removable mounted within said receptacle so that said filter trap may be transported to a laboratory after said filter trap has collected a predetermined quantity of tissue.
- [c24] A biopsy tool for removing large quantities of tissue from a lesion or tumor in a brief period of time, comprising:
 - a hollow needle having a cylindrical lumen and a pointed distal end;
 - a slot of elongate, longitudinally-extending configuration formed in a cylindrical side wall of said hollow needle;
 - said slot having a distal end disposed proximal to said pointed distal end of said hollow needle;
 - a balloon mounted in deflated configuration on an external surface of said

hollow needle in diametrically opposed relation to said slot;
inflation means for inflating said balloon;
said balloon adapted to press against tissue when inflated, thereby urging said slot to press against a lesion or tumor so that said lesion or tumor enters into said slot and therefore into the cylindrical lumen of said needle;
an inner tube of hollow cylindrical configuration disposed within said cylindrical lumen of said hollow needle;
rotation means for rotating said inner tube about its longitudinal axis;
an opening formed in said inner tube, said opening having sharp peripheral edges so that a lesion or tumor pushed into said slot by said inflated balloon is sheared off by a sharp peripheral edge of said opening as said opening rotates past said slot;
said opening being in intermittent registration with said slot as said inner tube rotates about its longitudinal axis;
whereby inflation of said balloon urges said slot to press against said lesion or tumor to cause said lesion or tumor to enter into said cylindrical lumen of said hollow needle;
whereby a quantity of said lesion or tumor is sliced off by said sharp peripheral edge during each rotation of said inner tube;
whereby a large quantity of said lesion or tumor is removed by said biopsy tool in a brief amount of time;
whereby said biopsy tool eliminates a need to perform a biopsy and a lesion or tumor removal procedure in two separate steps; and
whereby each slice of lesion or tumor removed is in substantially undamaged condition so that it is suitable for use in a laboratory as a biopsy sample.

[c25]

The biopsy tool of claim 24, further comprising:
a vacuum source in fluid communication with said cylindrical lumen of said hollow needle so that said lesion or tumor is pulled into said slot by said vacuum in conjunction with the pushing of said lesion or tumor into said slot by said inflated balloon;
whereby each piece of sliced off tissue is pulled toward said vacuum source so that said slot and opening are clear of tissue for each rotation of said inner

tube.

[c26] A biopsy tool for removing large quantities of tissue in a brief period of time, comprising:
a hollow needle having a cylindrical lumen and a pointed distal end;
a slot of elongate, longitudinally-extending configuration formed in a cylindrical side wall of said hollow needle;
said slot having a distal end disposed proximal to said pointed distal end of said hollow needle;
a cutting cannula having an inner diameter sufficient to slidingly receive said hollow needle therein;
said cutting cannula having a sharp leading end;
motor means for reciprocating said cutting cannula along its longitudinal axis between a first retracted position where said slot is uncovered and a second extended position where said slot is covered by said cutting cannula;
a vacuum source in fluid communication with said lumen of said hollow needle so that a lesion or tumor is pulled into said slot by said vacuum;
said motor means moving said cutting cannula from its retracted position to its extended position only when said vacuum has pulled said lesion or tumor through said slot into said cylindrical lumen of said hollow tube;
said motor means maintaining said cutting cannula in said extended position until a severed piece of lesion or tumor is removed from said cylindrical lumen of said hollow needle by said vacuum;
whereby a quantity of tissue is sliced off by said sharp leading end during each reciprocation of said cutting cannula;
whereby each piece of sliced off tissue is pulled toward said vacuum source so that said slot is clear of tissue for each reciprocation of said cutting cannula;
whereby a large quantity of tissue is removed by said biopsy tool in a brief amount of time;
whereby said biopsy tool eliminates a need to perform a biopsy and a tissue removal procedure in two separate steps; and
whereby each slice of tissue removed is in substantially undamaged condition so that it is suitable for use in a laboratory as a biopsy sample.

[c27] A biopsy tool, comprising:

a hollow needle having a cylindrical lumen and a pointed distal end;

a slot of elongate, longitudinally-extending configuration formed in a cylindrical side wall of said hollow needle;

said slot having a distal end disposed proximal to said pointed distal end of said hollow needle;

a vacuum source in fluid communication with said cylindrical lumen of said hollow needle so that tissue is pulled through said slot into said cylindrical lumen by said vacuum;

an annular blade slidably disposed within said cylindrical lumen of said hollow needle;

said annular blade having a retracted position where said annular blade is positioned distal of said slot and said annular blade having an extended position where said annular blade is positioned proximal of said slot;

a collecting bag connected to said annular blade on a distal side thereof for conjoint movement therewith;

said collecting blade having a closed bottom and an open mouth, said annular blade being positioned at said open mouth;

displacement means for displacing said annular blade and collecting bag from said retracted position to said extended position;

whereby a quantity of tissue is severed from a lesion or tumor by said annular blade when said annular blade is displaced from said retracted position to said extended position;

whereby said quantity of tissue severed from said lesion or tumor is collected by said collecting bag after it is fully severed;

whereby said collecting bag is removed from said cylindrical lumen of said hollow needle after said quantity of tissue has been severed; and

whereby the quantity of tissue severed from said lesion or tumor is in substantially undamaged condition so that it is suitable for use in a laboratory as a biopsy sample.

[c28] The biopsy tool of claim 27, wherein said annular blade is an RF blade and wherein said displacement means includes RF energy from an RF energy source

connected to said annular blade.

[c29] The biopsy tool of claim 27, wherein said annular blade is an ultrasound blade and wherein said displacement means includes ultrasound energy from an ultrasound energy source connected to said annular blade.

[c30] The biopsy tool of claim 27, wherein said annular blade is a light-activated blade and wherein said displacement means includes light energy from a light energy source connected to said annular blade.

[c31] The biopsy tool of claim 30, wherein said light energy is laser energy.

[c32] The biopsy tool of claim 30, wherein said light energy is infrared energy.

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